

welding of sheet-iron, and various methods are described. But surely it should not be necessary to print letters from the Public Works Department of Perth, W. Australia, and from other bodies, writing in appreciative terms of a certain process which, as we are not advertising it, we need not mention. To our mind, in book-writing the author should use his own judgment, which may or may not be influenced by letters of recommendation, but it says little for his analytical skill if he finds it necessary to print the letters.

The part of the book dealing with the welding and cutting of metals is extremely interesting, and illustrates the great advance which has recently been made in this direction. In all autogenous processes a reducing flame which prevents the formation of oxides is a *sine qua non*; but when a flame is to be used for cutting purposes the reverse is the case. Most metals, when heated to a sufficiently high temperature, will burn in oxygen. This property is made use of in cutting steel, for example. An oxy-hydrogen flame is caused to impinge upon the metal, and at the same time an auxiliary blow-pipe directs oxygen gas upon the heated surface; immediate combustion ensues. The stream of oxygen is sufficiently powerful to drive away the oxide as it is formed, and the cutting progresses very rapidly. For example, an armour plate 6.3 inches thick was thus cut to a length of 1 metre in ten minutes. At Bremen a similar process has been employed for cutting up and scraping ships.

The book is suggestive, useful, and will, we hope, enjoy a large circulation in spite of the few errors here pointed out, and when the second edition is being prepared we trust the author will take notice of our friendly criticism.

F. M. P.

PROBLEMS IN NUTRITION.

Volksernährungsfragen, and Kraft und Stoff im Haushalte der Natur. By Prof. Max Rubner. Pp. iv+143 and 181 respectively. (Leipzig: Akademische Verlagsgesellschaft, 1908, 1909.)

THESE two little books contain three useful and readable essays on those nutritional problems to which Prof. Max Rubner has directed most of his research work. The first of the above-mentioned books contains two of these, and they treat of the minimum protein requirement of man and of diet of the poor respectively. The first question has within recent years been brought prominently before the scientific world, as well as the public at large, by the work of Chittenden and others, who argue from their experiments that, because they themselves have been able for limited periods to maintain their health and equilibrium on an amount of protein which is far below the usually accepted Voit minimum, therefore all men should permanently reduce their intake of protein to the same low level. Those who believe that the minimum is also the optimum would do well to read and consider carefully the Berlin professor's judicial commentary on their views.

What most strikes the reader is the extraordinary complexity of the problem. One factor, however, is absent, and that is the effect of work and rest, for

this causes practically no effect on the metabolism of protein matter; but the question is sufficiently complex without this. There is between different people an enormous variation in what one may term their metabolic habits, so that any hard and fast rule is impossible. The mere body weight is not an important element, although, naturally, the heavier a man the more protein will he require. If this were all, it would be easy to adapt the dosage to the body weight; but the difference is deeper than this; to mention one point only, it is shown that, as a rule, the thin person requires more protein to maintain nitrogenous equilibrium than the corpulent. It must have been a matter of common observation that the stoutest people are not the biggest eaters. Another complicating factor is what one eats with the protein, and also the kind of protein one ingests. It is shown that on a potato diet, for example, the minimum necessary to maintain nitrogenous equilibrium is less than with any other of the diets adopted. We have further to take into account the presence, in most foods, of nitrogenous substances which are not protein, but which, nevertheless, have to be reckoned with.

The second essay, on the diet of the poor (agricultural labourers and the like), emphasises very clearly one reason why a low protein intake brings the consumer dangerously near to the margin. It is shown beyond question that such a diet renders people much more prone to take infectious diseases, and there is a general lowering of the powers of resistance. Considering that the bulk of the population consists of those who are not well to do, this becomes a matter of national importance, and it is the duty of the State to interfere. Prof. Rubner appears to think that legislative measures should be adopted. We can see, however, that the difficulty of legislating on such a matter is very great; but at least the people should be educated on the question of feeding rationally, especially where children are concerned. Any one with any experience of hospital patients knows that ignorance, in addition to poverty, is at the bottom of most of the conditions of malnutrition which meet us at every turn. Ignorance, moreover, is not confined to the poor in regard to this most important question.

The third essay, which occupies the second volume, is a summary of Prof. Rubner's work on nutrition generally; it is written in a more popular manner than most of his publications, and a distinct philosophical vein runs through it. The chemical events which occur in the living body fall mainly into two categories—(1) those due to the activity of enzymes; in these there is but little transformation of energy; and (2) those which may roughly be described as combustion, and from which the energy of living and doing is derived. It is the second class of chemical changes to which Prof. Rubner has mainly directed his attention, and it is to him, in particular, that we owe the experimental proof that the law of conservation of energy applies to the living cell as well as to the world of inorganic matter. The law of the conservation of energy is so universal that one might, perhaps, have assumed it would hold for living as well as for lifeless material. But the scientific mind

assumes nothing without direct proof; we have no right to assume beforehand that some other law might not be found operating in the organic world. The crude calorimetric researches of Lavoisier and the early pioneers of this subject certainly showed great discrepancies between the results obtained and those calculated from the energy value of the diets employed; but as technique has improved so has it been shown that all such discrepancies were the result of imperfection in the methods used. For the improvements in method, and the patient working out of the problem as well as the final demonstration of the truth of the great law of energy conservation in the world of life, there is no one to whom we owe more than to Prof. Rubner himself.

W. D. H.

COLOUR MANUFACTURE.

A Treatise on Colour Manufacture. A Guide to the Preparation, Examination, and Application of all the Pigment Colours in Practical Use. By George Zerr and Dr. R. Rübencamp; authorised English edition by Dr. Charles Mayer. Pp. xiv+605. (London: C. Griffin and Co., Ltd., 1908.) Price 30s. net.

THIS volume is the most complete publication on colour manufacture which has yet been produced in English. After dealing with the general preparation of materials, and describing the various types of grinding and sifting machines, in part ii. the manufacture of artificial mineral colours in dealt with in a very thorough manner, although in certain details inaccuracies are, as is to be expected, to be found.

Part iii. deals with the raw materials used in colour making, their properties, adulterations, and tests for purity. This section should prove very valuable in many colour works where the raw materials are bought in large quantities, and reliable information of this kind will enable them to be readily examined to test their purity.

The natural mineral colours and black pigments are then dealt with, and following upon this is a description of organic colouring materials and their utilisation in making lake pigments. The first section deals with natural organic substances, while the second section deals with the application of the coal tar colours to the manufacture of lakes. This section should prove of considerable value to colour makers, as it contains a scientific classification of the coal tar derivatives, and so reveals the principles upon which such lakes must be prepared. It is, of course, impossible that such a treatment of the subject should be up to date, as fresh coal tar products and fresh methods of obtaining trustworthy lakes from them are constantly being produced, but a study of these chapters will give the student a thorough grip of the principles underlying the manufacture of these lakes, and some interesting information will be found at the end of this section of the book on the reactions of the more important lakes from artificial colouring materials, which should be of use to those who wish to match samples that have been submitted. There is

also a brief account of the use of pigments in different ways which, while very general in character, contains some very interesting information.

In the appendix will be found a table of solubilities of many of the salts used by the colour maker, in cold and in hot water, which should prove of practical value, while there are in addition specific gravity tables for a certain number of these salts which should also be of use.

As has been stated, there are certain errors in detail to be noted, more especially in connection with the finer colours which are used for artists' purposes, and two of these which happened to have caught the eye of the reviewer may be pointed out. On page 154, Indian yellow is incorrectly described as being the same thing as cobalt yellow, Indian yellow being a preparation of euxanthic acid obtained from India, and cobalt yellow is described as being not very fast to air and light, while, as a matter of fact, it is one of the most permanent pigments to be found in the artist's palette. Again, under blue colours on p. 203, cobalt blue is spoken of as being now of no technical value. Considering the very large use of cobalt blue by artists and for superior decorative purposes, this statement is scarcely justifiable. The description of the manufacture of cadmium yellows is also very far from complete, and no doubt other similar small errors could be found throughout the book, and are inevitable in a work of this kind.

A more serious defect is one which is to be found in a great many works on colour manufacture. While elementary information on qualitative and quantitative analysis is published—see, for instance, the discussion of the methods of volumetric analysis on p. 343—information which it is only right to suppose is perfectly familiar to the modern colour maker and colour chemist, and simple qualitative tests are given which are to be found in all elementary books on qualitative analysis, little information is supplied as to the complete analysis of modern pigments. Such information would be of value even to the skilled analyst, who, when he comes across some pigment, wishes to know the probable defects to look for, the kinds of adulteration likely to be present, and the most rapid manner of handling with a view to making a sufficiently complete analysis for practical purposes. Some attempt to deal with this problem was made by Hurst in his book on pigments, but a more complete scientific handling of the subject is very much required.

In conclusion, this book may be safely recommended to all those interested in colour manufacture, as containing a great deal of useful and valuable information brought together in a clear and practical form.

UNIVERSITY ADMINISTRATION.

University Administration. By Charles W. Eliot. Pp. 266. (London: Constable; Boston and New York: Houghton, Mifflin and Co., 1909.) Price 6s. net.

UNIVERSITY politics has long been a current phrase, and questions of university government and policy have been increasingly discussed of recent years; yet, in spite of the rapid increase in the number